

ENGINEERING MANUAL

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Purpose: The purpose of this section is to define policy and provide guidelines for Nonutility Generation (NUG) and APS or the APS operating companies (West Penn Power Company, Monongahela Power Company, and The Potomac Edison Company), hereinafter referred to as APS, concerning interconnection facilities built for the main purpose of permitting nonutility generation installations to sell power to APS at the subtransmission or transmission voltage level. These voltage levels could range from 23 kV to 230 kV. Interconnection at higher voltage levels must be defined individually.

I. GENERAL REQUIREMENTS

A. Safety Requirements

(R)

1. The NUG's generating facility shall not energize a de-energized APS circuit.
2. NUG's circuit interrupting devices must have sufficient interrupting capacity for all faults that might exist on NUG owned facilities. Maximum fault current available from the APS system at the NUG's location will be provided by APS personnel.
3. NUG generators must cease parallel operation upon notification by APS personnel if such operation is determined to be unsafe, is deleterious to the supply of service to other customers or interferes with system operation, service restoration or maintenance.
4. The NUG assumes sole responsibility to design, install, operate and maintain the NUG system so that faults or disturbances within the NUG system will have minimal effect on the APS system.
5. The NUG assumes sole responsibility to design, install, operate and maintain the NUG system to be protected against faults or disturbances on the APS system.
6. The NUG is responsible for ensuring that the NUG protective relay system and associated devices are maintained in reliable operating condition. APS requires that periodic testing and maintenance, consistent with industry practice, be performed on the NUG's protective equipment. Test schedules and test results shall be available to APS upon request.

Source: Controls Engineering-BPS

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7. APS will provide adequate protection, at the interconnection point, to isolate the APS system from faults on the line between the interconnection point and the NUG breaker or circuit switcher.
8. The NUG is solely responsible for the installation, protection, operation and maintenance of all equipment located on the NUG side of the interconnection point, and is liable for any claims, demands, suits, actions and judgments, and all costs, expenses, pecuniary or other loss which might arise directly or indirectly from any act or omission of the NUG owner, its agents, servants or employees, particularly caused by improper installation, improper operation or defective equipment.

B. Service Quality Requirements

1. NUG generation must not adversely affect voltage, frequency, or waveshape of power supplied to interconnected APS customers.
2. Upon de-energization of interconnection circuit, NUG generation must be automatically disconnected from APS and remain disconnected until reconnection permission is granted by appropriate APS personnel.
- (A) 3. All electric generating and transmission equipment shall be capable of supplying contract active power and the required reactive power at the interconnection so that nominal voltage can be maintained throughout a power factor range of .9 lagging to .9 leading.

C. Interface Requirements

1. Request for interconnection shall be made by the NUG through the appropriate APS customer service organization or to the Director, Generation Planning. Approval of equipment, material specifications and methods of installation of the generation and interconnection facility must be obtained from APS prior to installation.
2. The point of interconnection will be determined by APS.
3. Synchronizing equipment is required and such equipment is to be installed by the NUG at the NUG generating facility.
4. Any APS electrical system modifications required to accept the generating facilities will normally be performed by APS at the NUG owner's expense. The necessity for any such modifications will be formally conveyed to the NUG owner by APS.

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(R) D. Facilities Ownership

The APS/NUG ownership line shall be located at the point of interconnection with existing APS substation facilities or at new APS substation facilities installed on existing APS lines for the interconnection of the NUG facilities. The exact division point shall be the line termination strain clamps at the APS substation deadend structure.

Any new line extensions from APS facilities, construction of APS substation facilities, and the associated facilities required for interconnection operation with the NUG facilities shall be the financial responsibility of the NUG. APS, however, reserves the right to review and comment on the NUG design and construction of the NUG interconnection facilities.

II. SPECIFIC REQUIREMENTS

- (A) A. NUG's facilities must include a circuit breaker or circuit switcher of sufficient interrupting capability to interrupt load or fault current from the NUG transformer to the APS point of interconnection or from the APS point of interconnection to the NUG transformer.
- (R) B. NUG's facilities must include a three-phase gang operated switch or its equivalent capable of being locked in the open position to provide a visible opening between the NUG transformer interrupting device and the APS point of interconnection.
- (A) C. NUG facilities required in II.A and II.B shall be located at or near the high voltage terminals of the NUG transformer.
- (R) D. Interlocks must be provided in the NUG facilities to prevent connection of the NUG generator to the APS system through any point other than the designated point of interconnection.
- (A) E. A three-phase gang operated switch, installed, owned and operated by the NUG shall be located one span from the ownership line. This switch shall have the capability of isolating the total NUG-owned facilities (excepting the first span of transmission line) from APS. Manual closing and opening of the switch shall be coordinated through the appropriate APS personnel and performed by NUG to isolate the NUG transmission line and generation facilities from APS and to provide a visible opening between NUG and APS facilities.

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- F. The NUG's generating facility must have the following minimum protection devices to automatically separate the generator(s) from the APS system upon loss of APS supply:
1. Undervoltage and overvoltage relaying.
 2. Overcurrent or voltage-controlled overcurrent relaying as required by good engineering practice.
 3. Overfrequency and underfrequency relaying.
 4. Adequate equipment to protect and interrupt all NUG connecting facilities to the point of interconnection.
- G. Automatic reclosing shall not be installed on the NUG interconnection disconnecting device.
- H. The NUG's generator step-up transformer must be connected grounded wye on the APS side.
- I. Request for information on interconnection must be made through an APS customer service organization or to the Director, Generation Planning-BPS.
- J. Specific protection requirements for the NUG facility will be based upon the design and nature of operation of the generator and associated equipment.
- K. The NUG's underfrequency relay settings must be coordinated with the APS procedures for Power System Emergency Operation. Specifically, this requires NUG's with a capacity greater than 5 MW to set their underfrequency relays at a frequency as low as 58 Hz.

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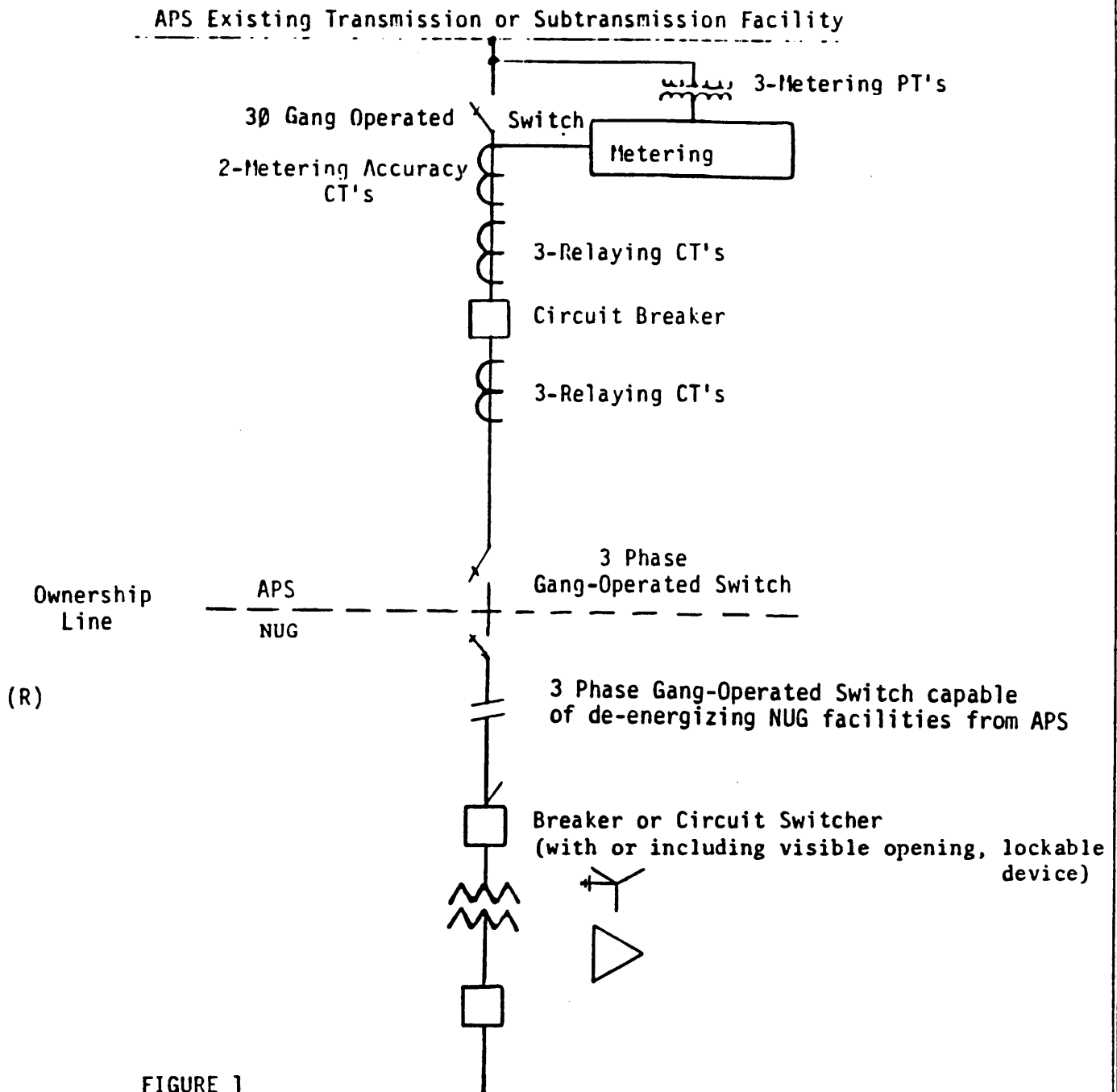


FIGURE 1

Source: Controls Engineering-BPS